



IOWA UNDERGROUND STORAGE TANK

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**TO: Scott Scheidel, Administrator Iowa UST Fund Program
Elaine Douskey, Iowa DNR - UST Section**

FROM: James R Gastineau

SUBJECT: 28E Agreement – Plastic Water Line Target Levels

DATE: September 26, 2009

This memo is presented to provide an understanding on the discussions completed by the Plastic Water Line Technical Advisory Committee (TAC) regarding the Iowa Department of Natural Resource Underground Storage Tank Section regulation pertaining to the plastic water line pathway evaluation and proposed target levels applicable to the evaluation.

The protocol used in the Iowa risk based corrective action (RBCA) process for evaluation of risk to plastic water lines has been in place since approximately 1996. Since inception, there has been a general perception that the target levels in use are overly conservative. The existing target levels were not based on any known scientific studies but were instead arbitrarily set to match the target level for the soil leaching and groundwater ingestion pathway for potential receptors. It's important to note that at the time created and also at the present time, there are no known industry standards nor is there a national consensus on how to address the potential risk presented by petroleum contaminants in proximity to water lines.

Discussions by the TAC over the past year have resulted in a general agreement to revise the soil and groundwater target levels used in the evaluation process. The basis for the change is primarily from data provided by James Gaunt, a researcher from Iowa State University (ISU) who in conjunction with others and funding provided by the AWWA Research Foundation completed a study which resulted in the publication "Impact of Hydrocarbons on PE/PVC Pipes and Pipe Gaskets". Based on this study, the research team stated that water lines constructed of PVC material are essentially impervious to permeation by petroleum products. While this statement is profound, other research studies suggest PVC *may be* permeated by petroleum. In reviewing public data, there are documented cases of petroleum impacts in plastic water lines, however for the most of the known incidents including those here is Iowa, the mechanism for impact is unknown and may be caused by processes other than permeation.

During discussions, the TAC agreed upon a recommendation to examine the current RBCA evaluation process for the water line pathway by considering the different types of water line materials used and to consider "gasketed" water lines, such as ductile iron pipes, in the evaluations. The purpose of this addition is to provide an added layer of protection to all water lines given the concern that petroleum contaminants may permeate the various pipe materials at differing rates and through gaskets, regardless of connecting pipe material.

In general, the TAC used available data to decide under what conditions permeation risks may exist. It was agreed no water lines should be placed or allowed in areas considered grossly contaminated

and where free product is present. In absence of these conditions, new soil and groundwater target levels were developed using data provided by ISU.

While the initial concept from the study is that PVC pipes are impervious, the TAC agreed upon a conservative approach in developing target levels. Data from the ISU experiments showing petroleum saturation concentrations observed in water were used as the starting point for determination of the benzene and toluene target levels. These saturation values were then adjusted downward by a series of safety factors to reflect concerns with the uncertainties that may otherwise affect water lines, such as possibility of material defects in the pipe, presence of service line taps, stagnation of water, and water line breaks.

For ethylbenzene and total xylenes in both soil and groundwater, a different approach was determined necessary as the ISU study did not find these compounds as much a concern as benzene and toluene. In fact, it was noted of the laboratory experiments, ethylbenzene permeated PE pipe 27 times slower than benzene or toluene, while xylenes permeated 15 times slower. Thus, the most conservative target levels for these compounds were set at the “saturation” values used in the ISU study. It should be noted that the saturation values calculated were not the maximums observed nor do they approach maximums seen in the environmental tests completed outside of the laboratory.

For the gasoline-derived BTEX compounds in groundwater, the TAC generally agreed to the following target levels for the different pipe materials:

	<u>PVC MAINS</u>	<u>PVC SERVICES</u>	<u>PE/PB/AC</u>	<u>Existing</u>
Benzene	7,500 ug/L	3,750 ug/L	200 ug/L*	290 ug/L
Toluene	6,250 ug/L	3,125 ug/L	3125 ug/L*	7,300 ug/L
Ethylbenzene	22,950 ug/L	11,475 ug/L	3,400 ug/L*	3,700 ug/L
Xylenes	71,250 ug/L	35,625 ug/L	19,000 ug/L*	73,000 ug/L

* Note: The TAC did not fully discuss or arrive at a consensus for the target levels associated with PE/PB/AC pipe. The benzene target had been agreed upon at 165 ug/L, however the calculation used to derive this value was revised and the value reported above was determined appropriate. The toluene value is also based on similar calculations, while the ethylbenzene and xylene values were taken from data derived from the ISU/AWWA RF study; all data and calculations were provided by J Gaunt (ISU).

For the gasoline-derived BTEX compounds in soil, a single set of target levels were calculated and are applicable to all water lines within 10 feet of a soil plume defined to these limits:

	<u>Proposed</u>	<u>Existing</u>
Benzene	2.0 mg/Kg	1.8 mg/Kg
Toluene	3.25 mg/Kg	120 mg/Kg
Ethylbenzene	26 mg/Kg	15 mg/Kg
Xylenes	79 mg/Kg	NA

For the diesel and waste oil target levels in soil and groundwater, the TAC was unable to develop new target levels. During discussion, it was noted there are no known scientific studies to support the idea that a risk exists from the compounds found in diesel and waste oil, however several publications do indicate a risk may exist. In reviewing data regarding the four known detects of these compounds in water systems in Iowa, it was noted the source of the contaminant, if the contaminant detection was actually diesel or waste oil, and/or the mechanism of impact for each incident is unknown. Thus, while a recommendation was made to eliminate the target levels for these compounds, the TAC recommended the existing standards be retained and applicable to all water lines.

Note: Since the goal of the discussions were to bring science into the process, it is my recommendation that unless scientific data is provided to support the determination of a risk within a reasonable time period, that the Department remove the target levels for these compounds.

It is recommended the target levels listed be applied to all water lines within the ACTUAL plumes defined to the stated target levels. Sampling of the water supply from water lines within a SIMULATED plume for these target levels may also be considered, but not required, to provide an added layer of protection.

A special thanks is given to those who gave their time, resources, and effort in the pursuit of developing scientifically defensible target levels for the evaluation of all water lines in Iowa:

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